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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/797,011

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EXAMINER

RADKIEWICZ, JARED

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/797,011	Applicant(s) SAKAI ET AL.	
	Examiner Jared W. Radkiewicz	Art Unit 2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-17 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 3/11/2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>3/11/2004</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Claim Objections - 37 CFR 1.75(a)

1. The following is a quotation of 37 CFR 1.75(a):

The specification must conclude with a claim particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention or discovery.

2. **Claims 7 and 15** are objected to under 37 CFR 1.75(a), as failing to particularly point out and distinctly claim the subject matter which application regards as his invention or discovery. Claims 7 and 15 recite "processing speed substantially equal to an image capturing speed". The underlined term "substantially" is ambiguous and does not define exactly what range is being claimed. Correction is required.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. **Claims 1, 7, 9 and 15** are rejected under 35 U.S.C. 102(b) as being anticipated by Koshishiba et al. (US 5,051,585).

Regarding **claim 1**, Koshishiba teaches a method of inspecting a pattern ("method of pattern detection", Column 2 Line 6), comprising the steps of:

sensing images of corresponding areas of two patterns, which are originally formed so as to have an identical shape on a substrate, to obtain a reference image and an inspection image ("reference image" and "detected image", Column 14 Lines 20-26);

with respect to the reference image and the inspection image obtained by sensing images of the corresponding areas, performing correction of a difference in brightness for effecting correspondence between each of first unit areas and a difference in brightness for each of second unit areas which are larger than the first unit areas ("FIG. 15 shows the brightness correcting mechanism", Column 11 Line 60); and

detecting a defect using the reference image and the inspection image for which the correction of brightness for each first unit area and the correction of brightness for each second unit area have been performed ("The defect judgment circuit 19 discriminates as defects, only inconsistent portions which are above an allowable level.", Column 9 Line 6).

Regarding **claim 7**, Koshishiba teaches a method of inspecting a pattern, comprising the steps of:

sequentially sensing images of corresponding areas of two patterns, which are originally formed so as to have an identical shape on a substrate, using an image sensor to sequentially capture images of the corresponding areas ("reference image" and "detected image", Column 14 Lines 20-26, are both acquired via a single image sensor ("a scanning transmission electron microscope", Column 2 Line 31), necessitating both images to be sensed sequentially); and

performing correction of positional deviation ("The reference image and STEM image are subjected to position matching", Column 9 Line 3), correction of brightness ("FIG. 15 shows the brightness correcting mechanism", Column 11 Line 60), and detection of a defect ("The defect judgment circuit 19 discriminates as defects, only inconsistent portions which are above an allowable level.", Column 9 Line 6) by parallel processing with respect to images subsequently captured by sensing images of the areas with the image sensor (the position matching and defect discrimination are performed "In parallel to the detecting operation", Column 8 Line 65),

wherein the images are processed at a processing speed substantially equal to an image capturing speed of the image sensor ("the real time process is possible", Koshishiba Column 6 Line 38).

Regarding **claims 9 and 15**, Koshishiba also teaches an apparatus ("apparatus and method of pattern detection", Column 2 Line 5).

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. **Claims 2 and 10** are rejected under 35 U.S.C. 103(a) as being unpatentable over Koshishiba et al. (US 5,051,585) in view of Tanaka et al. (US 2002/0022185 A1) and Maeda (US 6,169,282 B1).

Regarding **claims 2 and 10**, Koshishiba teaches claims 1 and 9, respectively.

Koshishiba does not teach correction of belt shaped patterns.

Tanaka teaches a method and apparatus wherein a difference of brightness which occurs in a belt shape ("belt-like shade patterns", Tanaka Paragraph 182) in the reference image and the inspection image according to the correction of brightness for each first unit area is corrected ("If a defect is detected, defect correction is performed", Tanaka Paragraph 188)

It would have been obvious at the time of invention to one of ordinary skill in the art to search the images in Koshishiba for belt shaped brightness differences as taught by Tanaka because "the periphery of the integrated circuit pattern region is surrounded by a belt-like shade pattern" (Tanaka Paragraph 182), and Koshishiba's invention inspects and correct defects on "circuit patterns" (Koshishiba Column 1 Line 10).

Koshishiba and Tanaka do not teach correction of random brightness patterns.

Maeda teaches correction a difference of brightness that occurs at random in the reference image and the inspection image according to the correction of brightness for each second unit area is corrected ("noise removal process", Maeda Column 13 Line 27).

It would have been obvious at the time of invention to one of ordinary skill in the art to search the images in Koshishiba and Tanaka for random brightness differences

as taught by Maeda because noise is an undesirable defect resultant of most image capture methods.

Claims 3, 6, 11, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koshishiba et al. (US 5,051,585) in combination with Sakai et al. (US 2003/0021462 A1).

Regarding **claim 3**, Koshishiba teaches a method of inspecting a pattern, comprising the steps of:

sensing images of corresponding areas of two patterns, which are formed so as to originally have an identical shape on a substrate, to obtain a reference image and an inspection image ("reference image" and "detected image", Koshishiba Column 14 Lines 20-26);

correcting a difference of brightness between the reference image and the inspection image obtained by sensing images of the areas in multiple stages by different area units ("FIG. 15 shows the brightness correcting mechanism", Koshishiba Column 11 Line 60);

Koshishiba does not teach correcting brightness in multiple stages or producing a difference image.

Sakai teaches comparing the images for which brightness is corrected in multiple stages to obtain a difference image between both images ("a difference image as shown in FIG. 2 is produced after the alignment of the image to be inspected 11 with the reference image 12", Sakai Paragraph 5); and

comparing the difference image with a threshold value corresponding to the areas of the images to detect a defect ("If a part, a difference value of which is larger than or equal to a specific threshold value TH, is regarded as a defect", Sakai Paragraph 6).

It would have been obvious at the time of invention to one of ordinary skill in the art to add the difference image and threshold comparison of Sakai to the pattern inspection method of Koshishiba to detect differences in patterns between the reference image and the acquired image.

Regarding **claim 11**, Koshishiba also teaches an apparatus ("apparatus and method of pattern detection", Koshishiba Column 2 Line 5).

Regarding **claims 6 and 14**, Koshishiba and Sakai teach a method of inspecting a pattern according to claim 3, wherein the threshold value according to the areas of the images is a threshold value corresponding to a difference of partial brightness of the images ("If a part, a difference value of which is larger than or equal to a specific threshold value TH, is regarded as a defect", wherein a difference between the brightness of two images is partial in every case except the case when one image has full brightness and the other has no brightness; Sakai Paragraph 6).

Claims 4, 5, 12, and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koshishiba et al. (US 5,051,585) in combination with Sakai et al. (US 2003/0021462 A1) in further view of Kondo et al. (US 2003/0118217 A1).

Regarding **claims 4 and 12**, Koshishiba and Sakai teach claims 3 and 11, respectively.

Koshishiba and Sakai do not teach brightness correction by changing the area of operation on the target image.

Kondo teaches correction of brightness in multiple stages is performed by changing the size of a unit area for which brightness correction is performed on the images ("calculation of the brightness gradient in the brightness correction step is performed using a filter having a predetermined size and changing the size of the face image to correspond to the filter size", Kondo Paragraph 14).

It would have been obvious at the time of invention to one of ordinary skill in the art to use the method of brightness correction of Kondo in the pattern inspection method of Koshishiba and Sakai because both inventions generally relate to image enhancement, and Kondo's method accommodates the situation wherein the brightness correction filter is of fixed size.

Regarding **claims 5 and 13**, Koshishiba and Sakai teach claims 3 and 11.

Koshishiba and Sakai also teach correction of a positional deviation between the reference image and the inspection image obtained by sensing images of the areas

("The reference image and STEM image are subjected to position matching", Column 9 Line 3).

Koshishiba and Sakai do not teach brightness correction by changing the area of operation on the target image.

Kondo teaches a difference of brightness between corresponding parts of the reference image and the inspection image, for which positional deviation is corrected, is corrected in multiple stages by different area units ("calculation of the brightness gradient in the brightness correction step is performed using a filter having a predetermined size and changing the size of the face image to correspond to the filter size", Kondo Paragraph 14).

Claims 8 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koshishiba et al. (US 5,051,585) in combination with Shibata et al. (US 2003/0081201 A1).

Regarding **claims 8 and 16**, Koshishiba teaches claims 7 and 15, respectively.

Koshishiba does not teach the speed for processing the images is in the range of 1.6 Gpps to 6.4 Gpps.

Shibata teaches a TDI imaging sensor with a processing speed sufficient to cover the specified range ("detecting speed of 50 Gpps", Shibata Paragraph 88).

Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Koshishiba et al. (US 5,051,585) in combination with Maeda et al. (US 5,649,022).

Regarding claim 17, Koshishiba teaches claim 15.

Koshishiba does not teach a TDI image sensor.

Maeda teaches the apparatus according to claim 15, wherein the image sensor of the image sensing means is a TDI image sensor of a parallel output type ("In FIG. 8, the above-described TDI image sensor 50 outputs a plurality of image signals 51-1 to 51-n for, e.g., 8 channels in a parallel form", Maeda Column 17 Line 41).

It would have been obvious at the time of invention to one of ordinary skill in the art to use the parallel TDI image sensor of Maeda in the apparatus of Koshishiba as part of a "pattern checking apparatus capable of eliminating the conventional drawbacks of the conventional techniques" (Maeda Column 2 Line 35).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jared W. Radkiewicz whose telephone number is (571) 270-1577. The examiner can normally be reached on 8:00 - 5:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian P. Werner can be reached on (571) 272-7401. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2624

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JWR

/Brian P. Werner/
Supervisory Patent Examiner (SPE), Art Unit 2624